

Peer review and journal models

Paolo Dall'Aglio

Sissa Medialab s.r.l.

E-mail: aglio@medialab.sissa.it

ABSTRACT: Tentative analysis of alternative peer review and journal models. Open Access and Impact factor issues are not covered. The bibliography, in alphabetical order, lists articles and web sites (with brief description).

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1. Introduction

The debate about concerning changes in scholarly publishing began well before the advent of the Internet, but it was with widespread use of the World Wide Web that many began to consider that a big change was behind the corner and that in a few year nothing was going to be as before [29].

In the late nineties several experiments of online journals emerged to propose new publishing models to make the most of the new medium. A big emphasis was on the chance to reduce costs and face the so-called ‘serials crisis’.

The two main sections analyze journal forms (section 3) and peer review (section 4). The most important content is in the bibliography that contains articles and web sites in alphabetical order with back references to the text. All web sites have been visited in the first half of august 2006, and almost all web sites references are briefly described.

1.1 Open Access

Open Access is not a goal of this study, but it has something in common with al the subjects covered here.

It is by far the most frequently discussed issue in specialized and general journals, with several congresses and journal special issues, not to mention single articles and contributions.

Just to give an idea we could mention

- The *Open Access Special* on the journal *Research Information* June/July 2006
http://www.researchinformation.info/features_junjul06.html.
- SPARC Open Access Newsletter: <http://www.earlham.edu/~peters/fos/>.
- Nature debate on Open Access
<http://www.nature.com/nature/focus/accessdebate/index.html>.
- Open Access Webliography <http://dlist.sir.arizona.edu/1005/01/oaw.htm>.
- Open Access Bibliography: liberating scholarly literature with e-prints and open access journals <http://www.digital-scholarship.com/oab/oab.htm>.

Hence, Open Access issues and more generally the problem of costs will not be covered and will be mentioned only when worth doing.

2. The ongoing debate

The debate is very lively and concerns all aspects of scholarly publishing: peer review, open access, copyright issues, self archiving. It features all kinds of contributions: from very abstract to the description of existing services.

This debate is going on mainly on a number of dedicated journals like: Learned Publishing [76], D-Lib Magazine [61], Science & Technology Libraries [93], and the no longer maintained Journal of Electronic Publishing [71].

Besides these publications, learned societies and big associations are funding research on the subject. For example the Association of Research Libraries [46] and the Scholarly Communications Group of JISC [88].

Also many specialized journals are greatly involved. First of all Nature, where articles on the subject appear very often and a debate on peer review is going on [81] together with an experiment of open-commentary peer review.

Then journals like BioMed Central [53], JAMA [70] and BMJ [54] often publish contributions on the subject, with a particular attention to the evaluation of their peer review systems.

It must be noted that great part of the discussion involves the biomedical sector, both scientists and journals staff, and this is probably due to the high importance those sectors give to quality controls and results certification.

An invaluable resource is the Scholarly Electronic Publishing Bibliography [92] by Charles W. Bailey Jr., updated at least twice a month, lists article, books and online resources.

3. The journal form

Unlike peer review, that we will discuss later, the debate on the journal form did not produce a great amount of statistical and objective studies, mainly because it is not possible

give measurable answers to the basic questions. Do journals work as they are? Do they need to be modified?

We could divide the contributions in this field into two categories: theoretical and experimental.

3.1 Abstract proposals

In this first class we can consider articles and studies that devise a revolutionary approach, without trying it in practice. Such entirely new models of scholarly communication usually include also a new form of review.

Few authors have tried to examine abstractly what are (and what should be) the functions played by a journal and which roles are in charge of them.

A very abstract study is the one by B.-C. Björk [4] that tries to give a formal model of the scientific communication process. The model is very detailed and hierarchical and includes the whole communication chain, from initial research to the assimilation of research results to everyday practice. Although the model treats both informal and formal communication, as well as the publishing of data, its focus is on modelling the publishing and indexing of traditional peer-reviewed journal articles, and finding and retrieving them. New developments enabled by the Internet, such as open access journals and e-print repositories, are also included.

A comparison with a previous model developed by Garvey and Griffith in 1972 [10] gives an idea of how recent developments added steps and facilities, but also highlighted the inner structure of processes that in traditional publishing appeared elementary.

A good analysis has been made by Smith [35] who identifies the *main roles*: editorial, quality control (content), quality control (form), recognition of work done, marketing, disseminating; and the *hidden roles*: subject defining, community defining, archiving.

More simply Van de Sompel et al. [40], based on [33], distinguish the following five functions of scholarly communication: Registration, Certification, Awareness, Archiving and Rewarding.

It is also interesting to read Elsevier's point of view [6] focused on technologies (semantic Web) and publishers' projects.

The Deconstructed Journal. The first important proposal was that of J. Smith [35, 36] of a Deconstructed Journal. DJ is based on a net of Subject Focal Points (SFP), subject dedicated portals that link to relevant items in the covered subjects. SFP's are different from journals in that they don't own nor host the articles, but point to them offering organized access and search facilities to subscribers. SFP's do not organize quality control.

The latter role is played by "evaluator organizations", that are paid by the author interested in having his work assessed. Nothing prevents authors having their work evaluated by more than one evaluator, and multiple SFP's can point to the same item.

Archiving would be ensured either by local repositories or by not for profit organisations like JSTOR [75].

The author view would be: (1) Prepare the article. (2) Place it on a visible server. (3) Notify one or more evaluator organizations. (4) Revises it in the light of comments. (5) Notify the relevant SFPs who place it on their recommended list if it is relevant.

Smith claims that this model would solve some well known problems of the traditional model such as the scattering of information across many journals in the same field, easier publication for unconventional ideas, delays in refereeing.

Two tier journal. Another model has been proposed by Paul Ginsparg [11, 12].

First a minimal, maybe semi-automatic, filter to access the standard tier. Then a much smaller set of articles is selected for the full peer-review. The selection can be based on objective data (citation impact, usage statistics) or user driven (reader nomination or rating) or editorial. Review, being on a smaller number of articles, could be combined: traditional, open or closed discussion ... Standard tier could be made up of institutional repositories and/or disciplinary archives.

“The system that scholars deserve”. In the stream of the analysis conducted by Van de Sompel and colleagues [40, 43], M. Rodriguez [32] proposed a deconstructed publication model in which the peer review process is mediated by an OAI¹-compliant peer-review service. This peer-review service uses a social-network algorithm to automatically determine potential reviewers for a submitted manuscript and for weighting the influence of each participating reviewer’s evaluations.

The social-network is based on coauthorship links, and selection of referees for a given article is made by automatic analysis of the bibliography. All potential reviewers can submit their comments, and give a score. Average scores are computed with adjustments. This system could allow also evaluation of the reviewers.

What is very interesting in this system is the selection of reviewers: a similar algorithm could be adopted also to assist editors in the choice.

The weak point that is common to all theoretical proposals is that they imagine a change of the system as a whole. Moreover if different models are possible then the best would be to see them coexist, allowing everybody to choose.

3.2 Concrete proposals

Atmospheric Chemistry and Physics. Maybe the most interesting proposal is the one by U. Pöschl [30] (see also Koop and Pöschl in the Nature debate [81]) who devises a two-stage (or multi-stage) publication processes with interactive peer review and public discussion. Its applicability is demonstrated by the open access journal Atmospheric Chemistry and Physics (ACP) [49]. ACP is a lively journal: many submissions, high impact factor. It is open access at a modest author-pays fee.²

More in detail. After basic filter by editor, articles are posted on a child journal called Atmospheric Chemistry and Physics Discussion, where it is accessible for discussion, during

¹Open Archive Initiative, see page 12.

²Very interestingly, not only authors of published papers pay, but all those that are admitted to discussion. This reduces consistently the pay-per-publish fees.

which the referees' comments (anonymous or attributed), additional short comments by other members of the scientific community (attributed) and the authors' replies are also published in ACPD. Afterwards, the authors are given a chance to revise their paper, which is then sent out for expert review, in which the identity of referees is confidential. At this stage referees are only supposed to return a verdict of 'pass' or 'fail', as any more detailed feedback should already have been received during the review period. If accepted, the final revised papers are published in ACP.

ACPD has its own ISSN, articles can be left there also if rejected and can be cited.

Different levels journals. The B.E. Journals in Theoretical Economics [51] are three connected economics journal, with unified submission.

Each submission will be considered simultaneously by these three quality-rated journals. A submission will, however, be accepted by at most one of these journals. The editor, after standard peer review, decides in which of the three journals it would be most appropriate.

- Advances in Theoretical Economics publishes articles that make significant advances;
- Contributions to Theoretical Economics publishes articles that make important contributions to specific literatures;
- Topics in Theoretical Economics publishes articles of interest to those working on specific topics;

A similar system is for The B.E. Journals in Economic Analysis & Policy (4 journals in one) and The B.E. Journals in Macroeconomics (4 journals in one).

Behavioral and Brain Sciences. A very "old" journal [50] that already existed before the web (born in 1979). Very relevant articles, after peer review, are selected for open commentary. The editor invites a number of reviewers to send their comments (at least 10). Comments are reviewed (sometimes edited). Sent to the author who can reply (but not modify the article). All this material is published together in the journal (a unique pdf file). It has a very high impact factor.

Psycology [87] was similar. The always quoted [18] journal created by Stevan Harnad used to publish comments together with articles, but hasn't published anything since 2002.

Living Reviews. As a different journal concept we can consider Living Reviews [77], three journals publishing only Review articles, solicited from experts in the field by an international Editorial Board, subject to peer-review, regularly being updated by their authors to incorporate the latest developments in the field. Nothing innovative in peer review, however. A similar model could be used for a particular section of a journal, devoted to reviews.

PLoS ONE. The new journal of the PLoS family [85]. The novelty is not only in the access model, common to all PLoS journals, but in that it is a unique big journal, not restricted to a subject, with open and closed peer review. It has just opened for submission (august 2006).

Each submission will be assessed by a member of the editorial board before publication. This pre-publication peer review will concentrate on technical rather than subjective concerns and may involve discussion with other members of the editorial board and/or the solicitation of formal reports from independent referees. If published, papers will be accompanied by comments from the handling editorial board member and will be made available for community-based open peer review involving online annotation, discussion, and rating. Reviewers may remain anonymous, but are strongly urged to sign their reports.

InterJournal. Another journal based on the idea that more interdisciplinary publishing areas are needed [69]. Aims to cover various topics in science and engineering. Moreover it does not directly host full text articles — that are left on the author chosen archive or server, together with all accompanying material such as computer programs, raw data, videos — but only metadata and comments.

Manuscripts are immediately accessible upon submission, and any qualified referee can review the article. However, at the discretion of the authors, during an initial refereeing period access may be limited to a few editor selected referees. The acceptance, category of publication, and subject areas of publication are ultimately determined by the editors.

Also **Advances in Theoretical and Mathematical Physics** [45] used to be an overlay of the archives and provided only certification. After an interruption of the service it is now a classic on-line journal.

Philica. [84] is an online academic journal accepting publications on any subject. It provides a process of academic peer review, transparent (reviews can be seen publicly) and dynamic (because opinions can change over time, and this is reflected in the review process).

Only academics can register and hence publish papers and write reviews.

Philica is like eBay for academics. When somebody reviews your article, the impact of that review depends on the reviewer's own reviews. This means that the opinion of somebody whose work is highly regarded carries more weight than the opinion of somebody whose work is rated poorly. A person's standing, and so their impact on other people's ratings, changes constantly. Reviews are anonymous.

Naboj. Also Naboj [80] is not a proper journal. It lets readers review online scientific articles. At present it allows to review only articles from **arXiv** [47]. The review system is modeled on Amazon and users have an opportunity to evaluate the reviews as well as the articles. Alpha version. Not many posts so far.

4. Peer review

4.1 What's wrong with peer review?

Many studies have made a thorough analysis of all the problems of peer review (see for instance Rowland [34], McKiernan [26], Williamson [44], Pöschl [30], Grivell [17]). In 2002 a general review of 19 different studies [21] concluded that there is “little evidence for effectiveness of scientific peer review”.

A summary list of problems could be:

- *Cost.*
- *Subjectivity.*
- *Bias.* Discrimination, or situations where author and referee are competitors in some sense, or belong to warring schools of thought. There is evidence³ of discrimination by fame, institution, geography, gender. Some institutions, like COPE [58], try to vigilate and assist complaining authors.
- *Abuse.* By authors
 - Too many articles out of one piece of research (so called salami-publishing), or duplicate publication.
 - Aiming too high: authors aiming too high enter a downward spiral of peer-review and rejection until the paper reaches its level. The same paper is reviewed many times (multiplication of costs, loss of time). To address this concern see [51]
 - Intellectual theft: omission or downgrading of junior staff by senior authors.

and by reviewers

- Plagiarism (stealing others yet unpublished work that has been sent for review).
- Delaying publication of potentially competing research.
- *Detecting defects.* Godlee et al. [14] report an experiment in which they modified a paper (already known and accepted for publication) introducing 8 areas of weakness and sent it to 420 reviewers. In the 221 reports received an average of 2 defects was detected. No one reported more than five defects, several zero.
- *Fraud and Misconduct.* Not generated by peer review but almost impossible to detect for referees
 - Fabrication of results
 - Falsification of data
 - False claim of authorship for results

³Evidence means statistical studies that report a correlation between review outcomes and different categories.

- *Delay.* Peer review is too slow, even though several journals set targets and often obtain they are respected.

Jennings in the Nature debate [81] defends peer-review as to find something better should meet several criteria. Something could help editors: manuscript tracking systems can provide feedback on where delays arise; feedback on the quality of their decisions: look retrospectively at the citations to accepted versus rejected papers,

In the end more than one author applied to peer review the famous Churchill’s sentence on democracy: it is the worst form of government except all those other forms that have been tried from time to time.

4.2 Alternative peer review models

Neo-classical. Classical peer review transplanted in the World Wide Web. This is what the great majority of journals do, particularly those that existed also as paper journals, with different degrees of web integration. From almost email only, to all-in-one web applications.

No peer review. There is a lot of people suggesting that peer review is no longer necessary, starting from the observation that all the articles on *arXiv* [47] are eventually published on some journal and that citation figures of *arXiv* itself and refereed journals are not different [9].

S. Mizzaro [27] proposes a system where all articles in a given repository are voluntarily and freely rated by readers. A very refined algorithm takes into account each reader’s judgment weighted on the basis of the reader’s skill as a reviewer, and readers are encouraged to express correct judgments by a feedback mechanism that estimates their own quality. This system was designed for the Tips project, see a simpler explanation in [39].

S. Harnad correctly points out that as long as peer review exists also the free material is written with that in mind: the invisible hand of peer review [19]. Also R. Kling [23] thoroughly analyzes the model of unrefereed scholarly publishing highlighting problems and difficulties.

An example of journal without peer review could be the naive experiment of Electronic Journal of Cognitive and Brain Sciences [64] proposed by Z. Nadasdy [28]: articles are freely rated by readers.

Open peer review. The most concrete and experimented proposal, although not a revolution.

The *British Medical Journal* [54] is probably the most prestigious journal to make reviewers’ names known to the authors [37].

In *BioMed central* [53], Many journals operate traditional anonymous peer review. Others, including the medical BMC-series titles, operate ‘open peer review’, in which reviewers are asked to sign their reviews. For these titles, the pre-publication history of each paper (including submitted versions, reviewers’ reports and authors’ responses) is linked to from the published article.

In *Journal of Medical Internet Research* [74] names of reviewers are published at the bottom of the paper.

The most complete analysis of the advantages of open peer review was done by F. Godlee [13]: ethical superiority, accountability, credit for the reviewers and authors' favour greatly outbalance the adverse effects. As revealed by a thorough study published on JAMA revealing the reviewers' identity doesn't seem to affect significantly reviewers' recommendations or time taken to review [41] detection of errors [14] and quality of reviews [22, 5].

Biology Direct [52] (see also Koonin et al. in the Nature debate [81]) not only makes peer review open but removes the journal's role in reviewer selection, making the author responsible for obtaining three reviewers' reports, via the journal's Editorial Board. In essence, an article is rejected from the journal if no appropriate Board member agrees to review it, because agreeing means associating one's name to that article. Limitations are imposed to avoid frequent author-referee couplings.

Linked to open peer review is the idea of authors suggesting one or more reviewers' names (for instance in JMIR [74] and many other journals) Also in this case quality of reviews is not significantly affected according to E. Wager et al. [42]. Another study points out that suggesting or excluding reviewers raises the probability of publication [16].

Many journals who maintain referees' names secret, at least acknowledge them publishing every year the full list of referees.

Double-blind peer review. In order to reinstate equilibrium in the author-reviewer dynamic some suggest to hide the author's identity as well [25]. It is suggested that this should address many concerns about peer review (subjectivity, bias ... see above). But this would work only with extremely honest reviewers, otherwise it is very easy to retrieve author's name (in physics it's enough to search the *arXives* [47]).

This kind of peer review is used, for instance, by *ASTRA — Astrophysics and Space Sciences Transactions* [48].

Commentary-based.

- *Commentaries pre PR*: this is the case already described in *Atmospheric Chemistry and Physics* [49]. It was also adopted by *Electronic Transactions on Artificial Intelligence* [66]: it provided a process for open discussion about articles and feedback to authors before an article was accepted. This discussion was shown and preserved on the ETAI website, and participants in the discussion were not anonymous. The discussion about the article was combined with subsequent confidential refereeing where referees are only supposed to return a verdict of 'pass' or 'fail'. The journal hasn't published since 2002

The noteworthy experiment of this kind is the one by *Nature* [8] that in june 2006 launched a trial of open discussion parallel to traditional peer-review. A submitted article, if the author so wishes, is posted in an open repository where it can be freely discussed. Traditional peer review goes on in parallel, and the editor can make the most of the discussion to achieve his decision. Very few comments posted so far.

- *Commentaries post PR*: *Psychology* and *Behavioural and Brain Sciences* have already been mentioned in the journal model section [50, 87].

The *Medical Journal of Australia* [78] in 1997 made a trial for post acceptance commentary to be published along with articles

<http://www.mja.com.au/public/information/project.html>. No report on results and no such issue in recent publications.

In *Expert Reviews in Molecular Medicine* [67], each article has an accompanying discussion group. Anyone can post comments and questions and/or reply to previous comments, with the possibility of being alerted for direct replies or new posts.

- *Commentaries pre & post PR: the Journal of Interactive Media in Education* [73] has a very complicate and thorough review process divided into stages: submission, editor chooses three experts, experts discuss with author, paper is made available to public and discussed by readers, authors and experts, paper is revised, published. Discussion can continue. All the material is published alongside the paper.

Established in 1996, after a good initial success now publishes very few articles.

Institution-based. One example is the so called guild model [24] based on the assumption that a given department (or research unit) has its own manuscript series. Access to these series is reserved to faculty members, with no other filter. In some sense papers are judged based on the careers of their authors.

Several softwares, like D-Space [63] and eprints [65], allow institutions to set up their manuscript repositories.

A different situation is the one of large HEP collaborations, studied by [7], where an internal peer review is in place. When submitted to peer reviewed journals, 100% of papers are eventually accepted,

Citation-based. Not really proposed or applied. Citation analysis could assist editors in the choice of referees (see above the journal that scholars deserve [32]). A very interesting tool that analyzes citations is CiteBase [55].

Of course also other services like Scopus [91], the (in)famous Science Citation Index [90] or Scholar Google [89] cover citation counting with different outcomes and different usefulness [3].

Computer-assisted. The Journal of High Energy Physics *JHEP* [72] falls in this category because of the automatic assignment to editors (based on a keywords driven algorithm). Such a system is not claimed by any other journal, it would probably deserve to be more widely publicized.

This is probably a field where many advances can be envisaged.

The automatized assignment to the editor could be improved using cognitive filtering: automatic analysis of a text (maybe the abstract or the full text) can create a profile to be compared with similar profiles created for each editor. This would give automatic assignments without even having to choose keywords (a potential source of mistakes).

Editors could be helped in the choice of referees by social-network based algorithm like the one proposed by Rodriguez [32].

It would also be possible to provide editors and referees with “objective data” concerning the paper like download and citation figures of the paper as a preprint.

Moderator-based. D. Stern [38] suggests a system where the moderator filters out only inappropriate or offending papers. All others are archived. Some (by the moderator, by download figures, by readers’ suggestion) are pointed to the attention of the editorial board.

In some sense it is similar to the model proposed by Rodriguez (see above the “system that scholars deserve”).

5. News from the outside world

W. Arms [2] (see also Arms in the Nature debate [81]) invites to consider what examples the web offers about quality assessing; even those coming from very different contexts. Along this path we can mention:

Wikipedia. On the footsteps of Wikipedia, an interactive encyclopaedia of the subject covered by the journal(s) could be established. Maybe a first version of some articles could be written by invited scientists. There are many open source softwares to manage a system like wikipedia (see for instance “wiki” on Wikipedia).

Also a list of keywords, or the taxonomy to categorize the materials could be managed collaboratively. See Anderson in the Nature debate [81].

Del.icio.us. It is a web site [60] for the public archiving of bookmarks. A collaborative tagging systems (analyzed by A. Golder et al. [15]) entirely user driven allows classification of the material.

Many other sites use collaborative tagging: *Flickr* (images) *Dailymotion* (video), ...and also *Connotea* [57], the Nature Publishing Group free online reference management system, similar to Del.icio.us, for all researchers, clinicians and scientists to publicly archive and classify scholarly references and bookmarks.

Particularly devoted to articles is *CiteULike* [56]. Always with collaborative tagging. When one sees an interesting paper on the web, he can click one button and have it added to the personal library. CiteULike automatically extracts the citation details. The library can be shared with others, and one can find out who is reading the same papers. In turn, this can help to discover relevant literature.

Blogs. Blogs are now quite frequent also in scientific communication. Nature has recently added blogs to its news articles (see for instance the blog on peer review <http://blogs.nature.com/nature/peerreview/debate/comments/>).

Concerning blogs see also [31]. As an example of blog for scientists see the *Mass Spectrometry Blog* [79].

The portal *Postgenomic.com* [86] collates posts from life science blogs and then does useful and interesting things with those data. For example, you can see which papers are currently being discussed by neurologists, or which web pages are being linked to by bioinformaticians. It also uses a tagging system.

Internet drafts. As Arms [2] points out there are situations where the final document must be almost perfect, and hence, without worrying about time, very complicated review processes are set up.

As described in at the The Internet Engineering Task Force [68] anybody can submit an Internet Draft, which will be 1. published as an Internet Draft; 2. openly commented on; 3. revised by its author(s); Steps 1 to 3 can be repeated a number of times. Then an Area Director has to take the draft to the IESG (Internet Engineering Steering Group) for wider discussion. Further changes can be required, or the draft can be rejected. The document still has to go through the states of Proposed Standard and Draft Standard to eventually become a Full Internet Standard. The whole procedure usually takes years.

A similar procedure is in place for the World Wide Web Consortium Process Document.

The interest of these processes is in the fact that very high quality is guaranteed without peer review. It could be of inspiration for the production of particular documents, like collaborative review articles.

6. Standards to be compliant with

These are the standards that nowadays all the most important journal respect.

- Open Archives Initiative [82]. Not only open access archives, but also big subscription-based publishers make their metadata available in a OAI-PMH-compliant format.
- DOI [62] — Digital Object Identifiers are used to retrieve objects persistently. A resolver is like CrossRef [59] is needed to transform DOIs into URLs: CrossRef participating publishers deposit article metadata, and CrossRef provides the link from the DOI to the original object.

A serious problem with DOI is explained in [20]: when a library has access to a resource through a consortium or another web site, this is ignored by DOI resolvers and the reader ends up in a page where cannot read the full text.

All major publishers take part in DOI, including IOPP.

- Unlike DOI, OpenURL [83] enables context-sensitive linking from a reference in a scholarly information system to resources relevant to the referenced item. Clicking on a link will pass the request to a linking server enabling the provision of a list of relevant services appropriate for the user.

See also A. Apps [1]: why OpenURL?

- Feed RSS. A system to keep users updated on what's going on on a site. IOPP already uses it <http://www.iop.org/EJ/help/-topic=rss/journal/1126-6708>.

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